United States General Accounting Office

GAO

Report to Congressional Requesters

January 1990

NASA PROJECT STATUS REPORTS

Congressional Requirements Can Be Met, but Reliability Must Be Ensured

GAO/NSIAD-90-40

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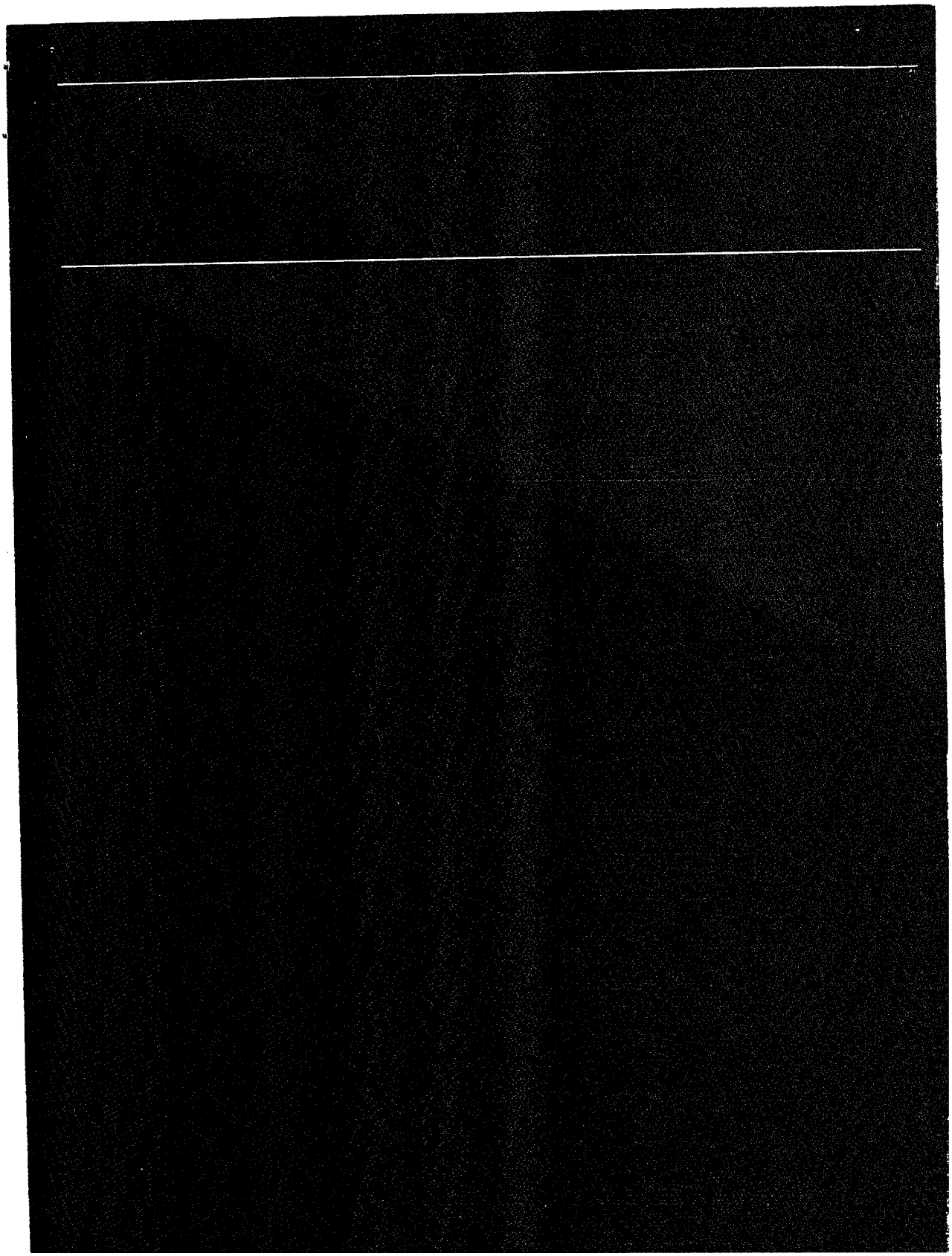

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-237602

January 23, 1990

Congressional Requesters

This report responds to your requests concerning how NASA can routinely produce Project Status Reports that meet your needs for reliable cost, schedule, and performance information on major NASA projects.

We are also distributing copies of this report to the NASA Administrator; the Director, Office of Management and Budget; and other interested parties.

Please contact me at (202) 275-5140 if you or your staff have any questions concerning the report. Other GAO staff members who made major contributions to this report are listed in appendix IV.

Mark E. Gebicke

Mark E. Gebicke
Director, NASA Issues

List of Requesters

The Honorable Albert Gore, Jr., Chairman
Subcommittee on Science, Technology and Space
Committee on Commerce, Science and Transportation
United States Senate

The Honorable Barbara A. Mikulski, Chair
Subcommittee on VA, HUD and Independent Agencies
Committee on Appropriations
United States Senate

The Honorable Robert A. Roe, Chairman
Committee on Science, Space and Technology
House of Representatives

The Honorable Bob Traxler, Chairman
Subcommittee on VA, HUD and Independent Agencies
Committee on Appropriations
House of Representatives

Executive Summary

Purpose

Funding requirements for the National Aeronautics and Space Administration (NASA) are expected to rise dramatically in the 1990s and could triple by the year 2000 if some recently proposed initiatives such as a lunar outpost or a staffed Mars expedition are adopted. Contributing substantially to these prospective increases are major existing and planned research and development projects. The current federal budget deficit environment adds to the challenge facing congressional decisionmakers in making increasingly difficult choices about what civil space projects will be undertaken and the pace at which they will be funded. Reliable information on the cost and progress of NASA's major projects can be a valuable resource for legislators when making budget allocation decisions.

NASA's four principal oversight Committees requested GAO to assess NASA's ability to produce status reports that meet their requirements for reliable cost, schedule, and performance information on major NASA projects. As part of this request, GAO helped the Committees and NASA agree upon project status reporting criteria and reviewed NASA's current process for developing these reports in a reliable manner.

Background

In its report on NASA Issues (GAO/OCG-89-15TR, Nov. 1988), GAO identified NASA's incomplete project cost reporting as an issue to be considered by the incoming administration and the Congress. While developing that report, GAO found that NASA had the capability to report more complete project costs and, on occasion, had done so since the mid-1970s at the request of one of its oversight Committees. In these Project Status Reports, NASA had provided the Committee with cost, schedule, and performance information on selected major projects.

The Project Status Report NASA has prepared since the mid-1970s was patterned after the Department of Defense's Selected Acquisition Reports. The Subcommittee on Veterans Affairs, Housing and Urban Development and Independent Agencies, Senate Committee on Appropriations, specified the NASA projects to be reported. From 1976 through 1989, NASA prepared 146 reports on 17 different projects. Project Status Reports were initially submitted on January 30 and July 31 of each year. However, since 1987—following a 1-year hiatus during which none were prepared—the reports have been submitted annually in March.

Results in Brief

New Project Status Report criteria for the selection of projects for reporting, the timing and duration of the reports, and the report format and structure have been established jointly by NASA's Comptroller's Office and the four requesting Committees. These criteria integrate NASA's reporting capabilities with the Committees' requirements for cost, schedule, and performance information on NASA's major projects.

NASA is able to produce the reports using the new criteria. However, additional internal controls over the process employed to develop Project Status Reports are needed to ensure their reliability. Unreliable project status information could mislead the reports' users, who rely on them to help make resource allocation decisions.

Principal Findings

New Criteria Have Been Established for NASA's Project Status Reports

New criteria for NASA's Project Status Reports have been established jointly by NASA Comptroller officials and the requesting Committees. NASA is able to develop the reports meeting the new criteria, and the resulting information satisfies the Committees' requirements for cost, schedule, and performance information on NASA's major projects.

Project Status Reports will now be developed on all NASA projects that meet the NASA Budget Administration Manual's definition of a project and are estimated to cost $200 million or more to research and develop. Starting on March 15, 1990, the reports will be prepared biannually—as of March 15 and July 30. Following a project's new-start approval, the reports will begin the first March after the project's estimate reaches the cost threshold and end with the report following project completion.

The revised Project Status Report has six parts. Part I is a narrative status report highlighting the project's current progress and problems. Parts II through V track the cost, funding, schedule, and performance of the project, as measured against NASA's estimates. Part VI presents key project background information. Appendix II illustrates the revised Project Status Report form.

Project Status Report Process Needs Additional Internal Controls

NASA has never formalized its process to develop Project Status Reports by developing written guidelines or specifying responsibilities for developing the reports. Guidance is informal and vague, as GAO found when it examined the 1988 report on the Magellan mission to Venus—one of seven 1988 Project Status Reports that year. Some of the Magellan data was inaccurate, out-of-date, and unverifiable. For example, some cost estimates were wrong; some milestones were not the most current; the latest acquisition cost estimate lacked documentation; the source of the upper stage development estimate was unknown; and NASA officials could not tell GAO who had developed the "Progress, Problems and Pending Decisions" narrative or upon what data it was based. NASA officials disagreed with GAO's findings but provided no documentation to support their position.

Recommendation

GAO recommends that the NASA Administrator examine NASA's process to develop Project Status Reports and establish the internal controls necessary to ensure that the Project Status Reports using the new criteria are reliable.

Agency Comments

As requested, GAO did not ask NASA to comment officially on a draft of this report. However, the views of responsible officials were sought throughout the course of GAO's work, and their comments were incorporated where appropriate.

NASA officials have agreed to the new criteria and are committed to reviewing and, if necessary, revising the report development process to ensure that the Project Status Reports delivered to the Congress are reliable. They have also agreed to prepare written guidelines to assist in the development of the reports.

Contents

Abbreviations

DDT&E	Design, Development, Test and Evaluation
FACS	Financial and Contractual Status
GAO	General Accounting Office
HUD	Housing and Urban Development
MO&DA	Mission Operations and Data Analysis
NASA	National Aeronautics and Space Administration
PSR	Project Status Report
TDRSS	Tracking and Data Relay Satellite System
VA	Veterans Affairs

Introduction

Background

In our report on NASA Issues (GAO/OCG-89-15TR, Nov. 1988), we identified the National Aeronautics and Space Administration's (NASA) incomplete project cost reporting as an issue to be considered by the incoming administration and the Congress. While developing that report, we found that NASA had the capability to report more complete project costs. NASA has provided, on occasion since the mid-1970s, Project Status Reports (PSR) on selected NASA projects at the request of the Chairman of the Subcommittee on VA, HUD and Independent Agencies, Senate Committee on Appropriations . The purpose of the reports was to provide timely information on the cost, schedule, and performance of selected major projects to assist the Subcommittee in its review of NASA's budget requests. The projects were selected in an ad hoc manner, according to the Subcommittee's interests.

The NASA Comptroller's Office is currently the NASA focal point responsible for preparing the PSRs. Once NASA receives a Subcommittee request for a PSR, the Comptroller's Office tasks the appropriate NASA program offices to submit PSR information, collects and combines the data provided, and submits the PSR to the Subcommittee.

The PSRs, which were patterned after the Department of Defense's Selected Acquisition Reports, include cost, schedule, and technical information under the following subject headings: mission and description; progress, problems, and pending decisions; mission/technical characteristics; scheduled milestones; program acquisition cost; funding; support costs; and other agency and foreign participation.

The PSRs were initially submitted on January 30 and July 31 of each year. Beginning in 1987, however—following a 1-year hiatus during which none were prepared—NASA began to submit PSRs annually in March. From 1976 through 1989, NASA developed 146 PSRs on 17 different projects. A complete schedule of these PSRs appears in appendix I.

Objectives, Scope, and Methodology

NASA's four principal oversight Committees[1] requested that we review NASA's ability to produce PSRs that meet their requirements for reliable cost, schedule, and performance information on major projects. As part of this request, we helped the Committees and NASA agree upon criteria

[1]The four requesting Committees are the Subcommittee on VA, HUD and Independent Agencies, Senate Committee on Appropriations; the House Committee on Science, Space and Technology; the Subcommittee on VA, HUD and Independent Agencies, House Committee on Appropriations; and the Subcommittee on Science, Technology and Space, Senate Committee on Commerce, Science, and Transportation.

for project selection and report timing, duration, format, and contents. We also reviewed NASA's current process for developing these reports.

To ensure NASA's ability to develop the new PSR, we worked with personnel from NASA's Comptroller's Office and used their comments in the development of the Project Status Report criteria. We also integrated NASA's comments with the Committees' requirements to establish a new set of mutually agreeable PSR criteria. Using the requesters' specifications, we interviewed representatives from each NASA program office to identify projects potentially eligible for reporting.[2]

To assess the reliability of the existing Project Status Report and the process used to prepare it, we selected one of the seven 1988 PSRs—the space science mission to Venus named Magellan—as a case study.[3] A NASA Comptroller official told us that the process used to prepare PSRs for space science projects—such as Magellan—was representative of the process used to prepare all NASA PSRs. We chose the space science project Magellan because it had a nearly completed and relatively uncomplicated development history.

We focused our work on NASA's Comptroller's Office and the Office of Space Science and Applications at NASA Headquarters in Washington, D.C. We also performed work at the Jet Propulsion Laboratory in Pasadena, California.

As requested, we did not obtain written comments on a draft of this report. However, we obtained the views of agency officials and considered them throughout the preparation of this report. Our work was performed from November 1988 to November 1989 in accordance with generally accepted government auditing standards.

[2]NASA has five program offices—the Office of Space Science and Applications, the Office of Space Flight, the Office of Aeronautics and Space Technology, the Office of Space Station, and the Office of Space Operations.

[3]In 1988 NASA prepared PSRs for the Ulysses, Mars Observer, Galileo, Hubble Space Telescope, National Aerospace Plane, Upper Atmospheric Research Satellite, and Magellan projects.

New Project Status Report Criteria

New criteria for NASA's Project Status Reports have been jointly established and agreed to by NASA Comptroller officials and representatives from NASA's four oversight Committees. These criteria address the selection of projects for reporting, specify the timing and duration of reports, and set out their format and structure. By adhering to the criteria, NASA will provide the Committees with timely cost, schedule, and performance information on its major projects.

PSR Selection, Timing, and Duration

PSRs will be prepared on all NASA projects that (1) meet the NASA Budget Administration Manual's definition of a project and (2) are estimated to cost $200 million or more to research and develop. The NASA manual defines a project as

"... an undertaking with a scheduled beginning and ending, which normally involves one of the following primary purposes: (1) the design, development and demonstration of major advanced hardware items; (2) the design, construction and operations of a new launch vehicle (and associated ground support) during the research and development phase; and (3) the construction and operation of one or more aeronautical or space vehicles and necessary ground support in order to accomplish a scientific or technical objective."

The Committees' representatives set a minimum cost criterion to limit PSRs to NASA's higher cost projects. The cost criterion was set at a minimum research and development cost estimate of 200 million real-year dollars.[1] This cost criterion can be re-examined in future years and adjusted upward to account for inflation.

Using these criteria, we asked officials in each of NASA's program offices to supply lists of their currently eligible projects. On the basis of these lists and in consultation with the Committees' representatives, we prepared a list of 19 projects eligible for the next PSR process beginning in March 1990, as shown in table 2.1.

[1]Real-year dollars include estimates of inflation in future years.

Table 2.1: NASA Projects Eligible for March 1990 PSRs, Listed by NASA Program Office

Program office	Project
Space, Science and Applications	Advanced X-Ray Astrophysics Facility
	Advanced Communications Technology Satellite
	Comet Rendezvous Asteroid Flyby/Cassini[a]
	Extreme Ultraviolet Explorer
	Galileo
	Gamma Ray Observatory
	Global Geospace Science
	Hubble Space Telescope
	Magellan
	Mars Observer
	Ocean Topography Experiment
	Ulysses
	Upper Atmospheric Research Satellite
Space Flight	Advanced Solid Rocket Motor
	Orbital Maneuvering Vehicle
	Replacement Orbiter
Space Station[b]	Flight Telerobotic Servicer
Aeronautics and Space Technology	National Aerospace Plane
Space Operations	Tracking and Data Relay Satellite System

[a]Although the Comet Rendezvous Asteroid Flyby and Cassini are two separate missions, NASA is requesting funding as if they were one project. As they progress in development, the cost estimates and milestones may begin to diverge, and it will become necessary to develop separate PSRs for each project.

[b]The Committees' representatives and NASA officials agreed that the Space Station Capital Development Plan would be used in lieu of a PSR for the space station. This plan—as directed by the 1988 NASA Authorization Act—includes a statement outlining the projected total cost, schedule, and configuration of the space station. It is to be prepared each of the fiscal years 1989 through 1996 and to be submitted along with the President's annual NASA budget request.

The Committees' representatives and NASA officials agreed that the PSRs for projects meeting the eligibility criteria would be prepared biannually—as of March 15 and July 30—so they are available for use both at the beginning of the budget review process and at the end during the final framing of the spending bills. These due dates, which closely coincide with NASA's biannual cost estimating process (on March 1 and July 1), will enable the PSRs to reflect current information.

PSRs on eligible projects will be submitted during the first March following congressional new-start approval or later when they reach the $200 million cost threshold[2] and end with a final PSR after project completion. For the purpose of the PSR, project completion is defined as the

[2]A PSR is prepared for a project when it reaches the $200 million cost threshold for its total estimated research and development. Sometimes a project may not meet this threshold until months or years after the initial congressional new-start approval.

time when NASA can assess how well the project has achieved its objectives. See appendix III for a more detailed discussion of project completion.

Format for the New PSR

The Committees' representatives approved the following six-part PSR format:

- Part I - Project Status,
- Part II - Project Cost Estimates,
- Part III - Funding for Project Development,
- Part IV - Principal Milestones,
- Part V - Project Goals and Objectives, and
- Part VI - Project Background.

Each part is briefly described below. Appendix II provides an illustration of the revised PSR, and in appendix III we describe its data elements and suggest source documents for its development.

"Part I - Project Status" calls for a brief narrative summary highlighting the project's most recent progress and any problems identified in other parts of the PSR. This section also requires a description of corrective actions taken or planned by NASA to mitigate the negative impacts of any problem identified.

"Part II - Project Cost Estimates" requires that the amount and reason for project cost growth be tracked over time. It requests two project cost estimate baselines—the initial project cost estimate that is developed when NASA first requests new-start approval and the development cost estimate that NASA managers prepare after they have a fuller picture of project costs (usually at the time of a project's Preliminary Design Review).[3]

Part II requires that NASA cost estimates be tracked over time for the NASA cost components—costs for the primary program office and the supporting program offices. Estimates of project costs incurred outside of NASA (by other U.S agencies and other participants) will also be listed in Part II. Because these estimates are developed by NASA's partners, NASA officials will only be responsible for reporting the latest estimates provided to them by these partners.

[3]The Preliminary Design Review is NASA's technical review of the project's basic design to ensure its producibility and compatibility with the project's requirements.

"Part III - Funding for Project Development" requires that the project's research and development funding be displayed in three ways—citing what has been funded, what is currently available, and what is needed for the future.

"Part IV - Principal Milestones" requires that the progress towards and the completion of key milestones be charted. Key milestones include

- the date of the announcement of science opportunity to the community of scientists outside of NASA (if applicable),
- the date that development contracts are awarded,
- the date when all Preliminary Design Reviews are completed,
- the date that all Critical Design Reviews are completed,[4]
- the launch date, and
- the date of project completion.

Part IV also requires two baselines—the "initial project estimate" and an updated "development estimate."

"Part V - Project Goals and Objectives" requires a summary of the project's goals and objectives (technological and/or scientific), as defined by NASA

- in its initial project presentation to the Congress,
- in its project development estimate, and
- in its assessment of final project performance.

"Part VI - Project Background" requires project information regarding

- the project's relationship to NASA's strategic plan and its contribution to other NASA missions;
- the general background of the project, including when it was approved as a new-start and the time and amount spent on it during "advanced studies";[5]
- the NASA components primarily involved and the extent of their involvement;
- the prime contractors and what they are to deliver to NASA; and
- the roles, responsibilities, and contributions of other involved participants, such as domestic and foreign commercial and academic entities.

[4]The Critical Design Review is NASA's review of the detailed design when it is approximately 90-percent complete to ensure that the project design is in compliance with NASA requirements.

[5]"Advanced studies" is NASA's term for all pre-project research activities.

Conclusion

New criteria for the selection of projects for PSR reporting, the timing and duration of the PSR reports, and the PSR report format and structure have been agreed to by NASA and the requesting Committees. The criteria integrate NASA's reporting capabilities with the Committees' requirements for timely cost, schedule, and performance information on NASA's major projects.

NASA Must Ensure the Development of a Reliable PSR

Although NASA has agreed to follow the new PSR criteria, NASA needs additional internal controls to ensure the preparation of reliable PSRs. NASA has had an informal process for developing PSRs. In attempting to trace and verify the information in one representative PSR—the March 1988 Magellan PSR—we found that NASA needs to improve that process. NASA must ensure that there are adequate internal controls in place to guide the preparation and processing of PSRs that are current, accurate, complete, and satisfy the basic criteria outlined in chapter 2.

PSRs Need to Be Reliable

Funding requirements for NASA are expected to rise dramatically in the 1990s and could triple by the year 2000 if some recently proposed research and development initiatives such as a lunar outpost or a staffed Mars expedition are adopted. In the current budget deficit environment, budget decisionmakers face increasingly difficult decisions on NASA budget allocations. They must decide what civil space projects will be undertaken and the pace at which they will be funded. Reliable cost, schedule, and performance information on NASA's major projects can help in making these decisions.

NASA provides the Congress with information on its research and development activities through testimony, budget estimates, and various reports; however, none of these methods provides the comprehensive and focused information the revised PSR will provide. The PSR will provide congressional decisionmakers with a concise picture of the cost, schedule, and performance status of NASA's major projects.

Congressional use of the PSR should reduce the frequency and volume of ad hoc information requests to NASA's project managers. For example, before the annual budget hearings, one of NASA's oversight Subcommittees typically requests projected total cost estimates for all major projects, information that another Subcommittee also requests in reviewing project status. These types of requests can be satisfied by the revised PSR. However, for the PSR to be a viable alternative to many ad hoc requests for information, as well as to serve as a reliable source of cost, schedule, and performance information, it must contain accurate, complete, and current information.

PSR Process Needs Additional Internal Controls

In order to understand NASA's reporting capabilities, we selected the March 1988 Magellan PSR as a case study and attempted to trace its data and to identify its supporting documentation. We found the PSR process to be vague and confusing.

NASA does not have formal instructions specifying the method for PSR development, the responsibilities of the individual NASA program offices involved, or procedures for PSR verification and review. Furthermore, none of the Comptroller and program office officials we interviewed could completely explain the informal PSR procedures being used or identify all the individuals responsible for the preparation of specific PSR information or the sources of such information.

The procedures employed by NASA to produce a PSR did not allow us to verify the accuracy of project information. NASA Comptroller officials told us that PSR information was generally prepared by updating a copy of the last PSR with handwritten corrections. NASA project and resource management officials told us that several program offices may comment on a particular PSR in this manner, and NASA Comptroller officials responsible for reviewing the PSRs have no record of where certain PSR information originated.

In tracing the sources of information used in the March 1988 Magellan PSR, we found data that was wrong, out-of-date, and unverifiable:

- The upper stage "prior years" and "FY 1988" funding figures were wrong. The figure reported in the March 1988 Magellan PSR for upper stage "prior year" funding was $15.2 million. According to NASA officials, it should have been $20.0 million. The funding for "FY 1988" was shown as $32.5 million, when it actually was $27.7 million, according to NASA Comptroller officials. The NASA Comptroller official responsible for these figures told us that the person who prepared them must have made a mathematical error.
- The milestones reported in the PSR for "Delivery of Spacecraft to KSC [Kennedy Space Center]" and "Launch" had not been updated with the latest information available at the time of the PSR's development. The PSR, which stated that its data was current as of January 31, 1988, indicated "Delivery of Spacecraft to KSC" during the first quarter of calendar year 1988. Yet the December 1987 Project Management Report—which was accurate according to NASA Comptroller officials—listed this date as the fourth quarter of 1988. Similarly, the PSR listed "Launch" for the second quarter of calendar year 1988, yet the Project Management Report listed it for the first quarter of 1989. A NASA Comptroller official

explained that these discrepancies had resulted from typographical errors.

Finally, unverifiable information was pervasive in the Magellan PSR. For example, the NASA officials responsible for the material in the "Progress, Problems and Pending Decisions" section of the PSR could not tell us who had prepared it or upon what data it was based. Similarly, NASA Comptroller officials did not know the origin of the development estimate for the Centaur upper stage. NASA officials also told us that the "Current Estimate" for Magellan acquisition cost had not been documented.

NASA officials disagreed with our finding that some data in the 1988 Magellan PSR was wrong, out-of-date, and unverifiable. Although they promised to provide us with documentation that would support this position, the evidence was not forthcoming.

Conclusions

During our review of the March 1988 Magellan PSR, we found data that was inaccurate, out-of-date, and unverifiable. We also found that the current process used to develop PSRs needs additional internal controls to ensure reliable PSR data. If the PSR data is unreliable, the report cannot be used as a basis for sound resource allocation decisions. In order to ensure the reliability and usefulness of the PSRs, NASA needs to establish adequate internal controls for preparing, processing, and reviewing PSRs. These controls are especially important as PSRs change from ad hoc reports on relatively few projects to routine, biannual reports on many more projects.

Specific internal controls to strengthen NASA's development of PSRs that meet the new criteria described in chapter 2 should begin with NASA's developing and institutionalizing PSR guidelines. These guidelines should

- identify an accountable NASA focal point who will ensure that PSRs are reliable and meet the prescribed criteria for project eligibility, report timing and duration, format, and contents;
- identify the NASA offices responsible for each specific part of the PSR;
- specify the sources of data to be used when preparing the PSR;
- establish verification and review procedures; and
- establish and maintain a complete historical file of PSRs.

NASA officials have agreed to review and, if necessary, revise the current process used to develop the PSRs to ensure that the PSRs delivered to the

Congress are reliable. In doing so, NASA has also agreed to develop written guidelines for preparing PSRs and to base the guidelines on the information provided in this report.

Recommendation to the NASA Administrator

We recommend that the NASA Administrator examine NASA's process to develop Project Status Reports and establish the internal controls necessary to ensure that the Project Status Reports using the new criteria are reliable.

Project Status Reports Filed in the NASA Comptroller's Office

Project	Submission dates
1. Space Shuttle	1/30/76, 1/31/77, 7/31/77, 1/31/79, 3/05/80, 7/31/80, 1/31/81, 7/31/81, 1/31/82, 7/31/82, 1/31/83
2. HEAO A-C	1/30/76, 7/31/76, 1/31/77, 7/31/77, 1/31/78, 7/31/78, 1/31/79, 7/31/79, 3/05/80, 7/31/80
3. Mariner Jupiter/Saturn Voyager	1/30/76, 7/31/76, 1/31/77, 7/31/77, 1/31/78, 7/31/78, 1/31/79, 7/31/79, 3/05/80, 7/31/80, 1/31/81, 7/31/81, 1/31/82
4. Pioneer Venus	1/30/76, 7/31/76, 1/31/77, 7/31/77, 1/31/78, 7/31/78, 1/31/79, 7/31/79
5. SEASAT-A or 1	1/30/76, 7/31/76, 1/31/77, 7/31/77, 1/31/78, 7/31/78, 1/31/79, 7/31/79
6. LANDSAT-C	1/30/76, 7/31/76, 1/31/77, 7/31/77, 1/31/78, 7/31/78, 1/31/79, 7/31/79
7. LANDSAT-D	1/31/78, 7/31/78, 1/31/79, 7/31/79, 3/05/80, 7/31/80, 1/31/81, 7/31/81, 1/31/82, 7/31/82, 1/31/83, 7/31/83
8. Hubble Space Telescope	1/31/78, 7/31/78, 1/31/79, 7/31/79, 3/05/80, 7/31/80, 1/31/81, 7/31/81, 1/31/82, 7/31/82, 1/31/83, 7/31/83, 7/31/84, 1/31/85, 3/25/87, 3/23/88, 3/30/89
9. Galileo	1/31/78, 7/31/78, 1/31/79, 3/05/80, 7/31/80, 1/31/81, 7/31/81, 1/31/82, 7/31/82, 1/31/83, 7/31/83, 1/31/84, 7/31/84, 1/31/85, 3/25/87, 3/23/88, 3/30/89
10. Ulysses	1/31/79, 7/31/79, 3/05/80, 7/31/80, 1/31/81, 7/31/81, 1/31/82, 7/31/82, 1/31/83, 7/31/83, 1/31/84, 7/31/84, 1/31/85, 3/25/87, 3/23/88, 3/30/89
11. Gamma Ray Observatory	1/31/81, 7/31/81, 1/31/82, 7/31/82, 1/31/83, 7/31/83, 1/31/84, 7/31/84, 1/31/85
12. Magellan	1/31/84, 7/31/84, 1/31/85, 3/25/87, 3/23/88, 3/30/89
13. Upper Atmospheric Research Satellite	3/25/87, 3/23/88, 3/30/89
14. Mars Observer	3/25/87, 3/23/88, 3/30/89
15. National Aerospace Plane	3/25/87, 3/23/88, 3/30/89
16. Comet Rendezvous Asteroid Flyby/ Cassini	3/30/89
17. Advanced X-Ray Astrophysics Facility	3/30/89

Project Status Report Form

Project Name:

PROJECT STATUS REPORT

Submission Date:

Table of Contents

Part I — Project Status

PART II — PROJECT COST ESTIMATES
(Real-Year Dollars in Thousands)

COST COMPONENTS	INITIAL PROJECT ESTIMATE	DEVELOPMENT ESTIMATE	LAST PSR ESTIMATE	THIS PSR ESTIMATE	AMOUNT OF AND REASON FOR CHANGE
PRIMARY NASA PROGRAM OFFICE OFFICE NAME _____					
SUPPORTING NASA PROGRAM OFFICES					
NASA SUBTOTAL					
OTHER U S AGENCIES					
OTHER U S PARTICIPANTS					
NON-NASA SUBTOTAL					
TOTAL					

PART III — FUNDING FOR PROJECT DEVELOPMENT
(Real-Year Dollars in Thousands)

	PRIOR YEARS	FY ____	FY ____	CURRENT FY ____	FY ____ REQUEST	FY ____	BALANCE TO COMPLETE	CURRENT PROJECT DEVELOPMENT COST ESTIMATE
PROJECT DEVELOPMENT FUNDING								

PART IV — PRINCIPAL MILESTONES
(Calendar Year and Month)

MILESTONES	INITIAL PROJECT ESTIMATE	DEVELOPMENT ESTIMATE	LAST PSR	THIS PSR/ ACTUAL*	REASON FOR CHANGE
ANNOUNCEMENT OF OPPORTUNITY					
DEVELOPMENT CONTRACTS AWARDED					
ALL PRELIMINARY DESIGN REVIEWS COMPLETED					
ALL CRITICAL DESIGN REVIEWS COMPLETED					
LAUNCH DATE					
PROJECT COMPLETION					

PART V — PROJECT GOALS AND OBJECTIVES

	PROJECT GOALS	SCIENCE/TECHNICAL OBJECTIVES
INITIAL PROJECT PRESENTATION TO CONGRESS		
DEVELOPMENT ESTIMATE		
LAST PSR		
THIS PSR		
REASON FOR CHANGE		
FINAL PERFORMANCE STATEMENT		

PART VI — PROJECT BACKGROUND

PROJECT'S RELATIONSHIP TO NASA'S STRATEGIC PLAN

GENERAL BACKGROUND

PRIMARY NASA COMPONENTS AND THEIR RESPONSIBILITIES

PRIME CONTRACTORS AND THEIR RESPONSIBILITIES

OTHER PARTICIPANTS AND THEIR RESPONSIBILITIES

Completing the PSR Form

This appendix describes the contents of the revised PSR form and, where appropriate, identifies source documents that could be used to complete it. Whenever possible, information reported in the PSR should correspond to information contained in NASA's internal automated cost reporting system.[1]

As depicted in figure III.1, the heading information includes the project name and the date the PSR is submitted to the Committees. The table of contents for the PSR is self-explanatory. Each individual PSR part is discussed below, including an explanation of what information should be included in each of the parts.

Figure III.1: PSR Heading and Table of Contents

Project Name: _____

PROJECT STATUS REPORT

Submission Date: _____

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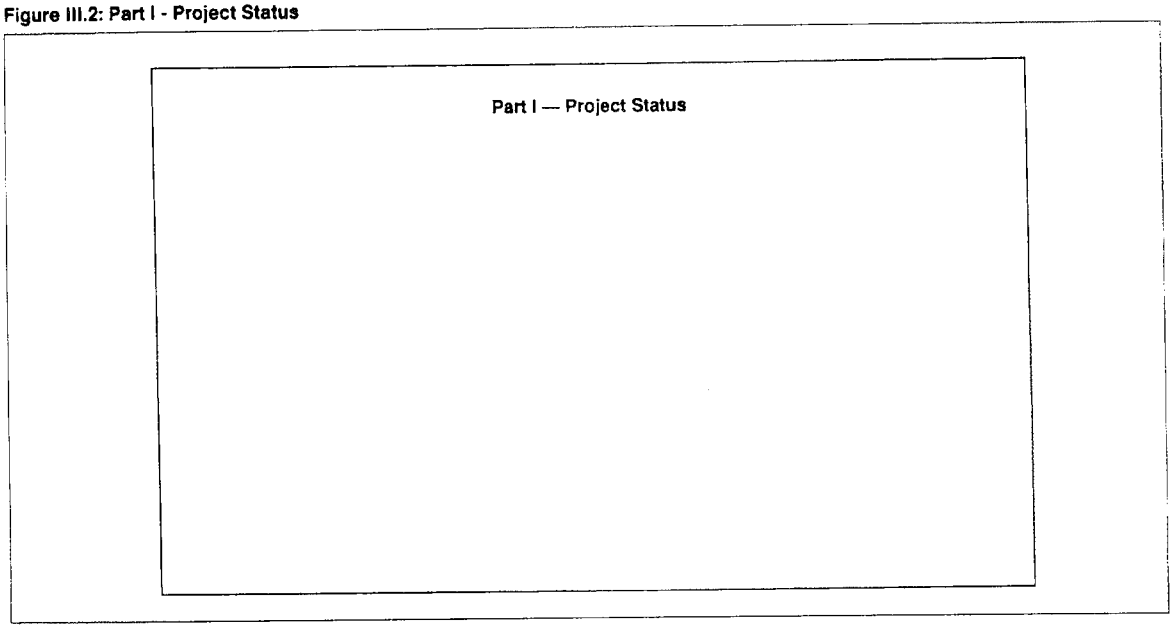
[1]NASA's Division of Financial Management maintains the Financial and Contractual Status (FACS) database, which reports all NASA financial activity. This database employs an automated Agencywide Coding Structure system, which identifies NASA's financial activities by project.

Part I - Project Status

"Part I - Project Status" summarizes the progress and/or problems with a project's cost, schedule, and performance. Part I explains NASA's corrective actions planned to mitigate the negative effects of any problem on the project's progress, such as requesting additional or reprogramming existing funding or de-scoping project objectives. The narrative should be tailored to fit in the space provided on the first page of the PSR. (See figure III.2.)

Figure III.2: Part I - Project Status



Part II - Project Cost Estimates

"Part II - Project Cost Estimates" tracks the amount of and reason for a project's cost growth over time. Project cost components are listed vertically down the left-hand column and then tracked horizontally by the estimate/change columns. (See figure III.3.)

Figure III.3: Project Cost Estimates

PART II — PROJECT COST ESTIMATES
(Real-Year Dollars in Thousands)

COST COMPONENTS	INITIAL PROJECT ESTIMATE	DEVELOPMENT ESTIMATE	LAST PSR ESTIMATE	THIS PSR ESTIMATE	AMOUNT OF AND REASON FOR CHANGE
PRIMARY NASA PROGRAM OFFICE OFFICE NAME: _____					
SUPPORTING NASA PROGRAM OFFICES					
NASA SUBTOTAL					
OTHER U. S. AGENCIES					
OTHER U. S. PARTICIPANTS					
NON-NASA SUBTOTAL					
TOTAL					

NASA Cost Components

The NASA cost components include the "Primary NASA Program Office" and the "Supporting NASA Program Offices." (See figure III.3.) The "Primary NASA Program Office" is the program office at NASA Headquarters responsible for the oversight of research and development costs that are unique to the project. The presentation of these costs should be consistent with NASA's cost reporting terminology and therefore will vary by project. For example, NASA usually displays the primary program costs for a science project, such as Magellan, as "Project Development" and "Mission Operations and Data Analysis" (MO&DA). On the other hand, for an operational project, such as the Tracking and Data Relay Satellite System (TDRSS), NASA may display the primary program costs as "Design, Development, Test and Evaluation" (DDT&E) and "Operational Capability Development."

On the basis of these examples, "Project Development" costs for a science project are costs incurred to develop the spacecraft, the costs of experiments/instruments, and the costs of ground operations. "MO&DA" costs are the costs to operate the spacecraft and to analyze the data transmitted to Earth. For the purposes of the PSR, the MO&DA estimate ends when the mission has completed its original objectives. (We define "Project Completion" in our section on "Milestones," p. 36.)

For a project with an operational objective, "DDT&E" is used to refer to costs incurred to design, develop, test, and evaluate the project. "Operational Capability Development" is the term NASA uses to refer to costs incurred by the primary program office to prepare the system for its full operational capability. For example, "Operational Capability Development" costs for the Tracking and Data Relay Satellite System could include the NASA Budget Estimate line items "Space network operations," "System engineering and support," and "Second TDRSS ground terminal."

The "Supporting NASA Program Offices" estimates include costs incurred by other offices primarily or exclusively in support of the project. Examples include

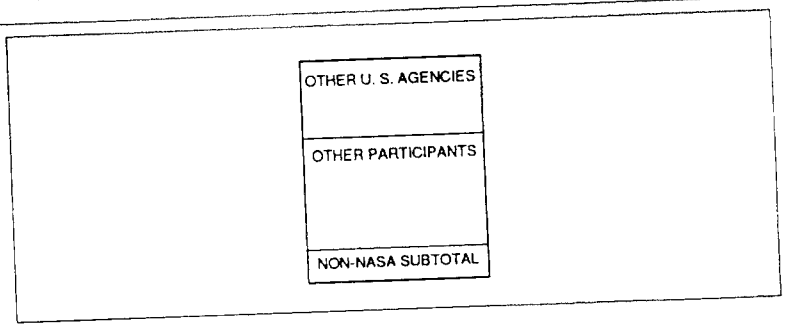
- the costs incurred by the Office of Space Operations in providing any project-related tracking and data acquisition services;
- the marginal cost of a launch when the space shuttle is required to launch a specific project, such as Magellan (currently estimated by NASA officials to be $50 million);

- the costs incurred by the Office of Space Flight to procure required expendable launch vehicle services and upper stage propulsion systems; and
- any costs incurred in the Construction of Facilities appropriation that are unique to the project and not already covered by the "Primary Program Office" cost estimates.

Non-NASA Cost Components

The non-NASA cost components are separated into costs for "Other U.S. Agencies" and for "Other Participants." (See figure III.4.) Because these estimates are developed by NASA's partners, NASA is only responsible for recording the latest cost estimates made available to it; NASA is not responsible for the completeness or accuracy of such estimates.

Figure III.4: Non-NASA Cost Components



"Other U.S. Agencies" estimates include costs to other federal agencies to supply NASA with goods and services in support of a project. For example, the cost incurred by the Department of Energy might include the cost to develop and deliver nuclear power supply equipment.

"Other Participants" estimates include planned expenditures (in equivalent U.S. dollars for foreign participants) by any foreign government and/or international and domestic commercial or academic entities that contribute directly to the project: for example, the estimated cost to the Federal Republic of Germany to provide the propulsion system for the Comet Rendezvous Asteroid Flyby project.

Estimate/Change Columns

The column headings "Initial Project Estimate," "Development Estimate," "Last PSR Estimate," and "This PSR Estimate" help track project estimates over time. The "Amount of and Reason for Change" column explains any change between the last and current PSRs. (See figure III.5.) Similar headings are used again in "Part IV - Principal Milestones" to track the project's schedule and in "Part V - Project Goals and Objectives" to track the project's performance. Therefore, the following discussion on estimate/change columns should also be used when completing those parts of the PSR.

Figure III.5: Part II - Column Headings

INITIAL PROJECT ESTIMATE	DEVELOPMENT ESTIMATE	LAST PSR ESTIMATE	THIS PSR ESTIMATE	AMOUNT OF AND REASON FOR CHANGE

The first column, "Initial Project Estimate," displays the original cost estimates NASA presented to the Congress when it obtained approval to begin the project. NASA's "Project Initiation Agreement" is a good source for this information, since it is the result of NASA's non-advocate cost reviews preceding the congressional new-start presentation. Although the "Primary NASA Program Office" cost estimate will be included, the "Supporting NASA Program Offices" and non-NASA cost estimates may not be fully available until NASA has a more complete picture of the project's costs.

The "Development Estimate" completes and updates the "Initial Project Estimate" by identifying the remaining cost components and by refining the original cost estimates. The "Development Estimate" is usually available around the time of the project's Preliminary Design Review. The Preliminary Design Review usually occurs about 2 years after new-start approval.

The "Development Estimate" for the "Primary NASA Program Office" cost estimate, project milestones, and performance and goals statements can be documented from the project's approved "Project Plan" and "Project Approval Document." The "Project Approval Document" can also be used to document the "Supporting NASA Program Offices" cost estimates.

Once established, the "Initial Project Estimate" and the "Development Estimate" will be repeated on all subsequent PSRs.

The "Last PSR Estimate" lists the estimated amounts shown on the PSR preceding the current one. The column labeled "This PSR Estimate" displays the most current estimate. The "Amount of and Reason for Change" column displays the difference between the columns "This PSR Estimate" and "Last PSR Estimate" and provides a brief but specific explanation for this difference. For example, any major design changes should be highlighted. Source documents for any changes and their explanations include the FACS database, Program Operating Plans, and/or the program office's most recent monthly Project Management Report or status reviews.

Part III - Funding for Project Development

"Part III - Funding for Project Development" charts the "Project Development Funding" both historically and prospectively. This funding corresponds to the amount listed by project line item in NASA's Budget Estimates. (See figure III.6.)

Figure III.6: Funding for Project Development

PART III — FUNDING FOR PROJECT DEVELOPMENT
(Real-Year Dollars in Thousands)

	PRIOR YEARS	FY ____	FY ____	CURRENT FY ____	FY ____ REQUEST	FY ____	BALANCE TO COMPLETE	CURRENT PROJECT DEVELOPMENT COST ESTIMATE
PROJECT DEVELOPMENT FUNDING								

The tracking begins with the "Prior Years" amount, which is the total of all project spending beginning in the fiscal year the project first received congressional approval up to 2 fiscal years prior to the current fiscal year. For example, if the current fiscal year is 1990, the "Prior Years" amount would cover all spending up through and including fiscal year 1987. Information from NASA's FACS database can document this entry.

"Project Development Funding" for the current and the previous 2 fiscal years—which are identified as "Current FY 1990," "FY 1989," and "FY 1988" in our example—should correspond to amounts recorded in NASA's most current Operating Plans (Op Plan) for those years. The figure entered as "Fiscal Year Request" should correspond to the current NASA budget request—which would be FY 1991 in our example. The next "FY " column—"FY 1992" in our example—presents one estimated outyear. The "Balance to Complete" column records the difference between the total "Current Project Development Cost Estimate" and the sum of all preceding entries in Part III. The "Current Project Development Cost Estimate" total should correspond to the most current "Primary NASA Program Office" development estimate recorded in Part II of the PSR. Figure III.7 presents Part III annotated with the sources of information.

Figure III.7: Instructions for Completing Part III

PART III — FUNDING FOR PROJECT DEVELOPMENT
(Real-Year Dollars in Thousands)

	PRIOR YEARS	FY ____	FY ____	CURRENT FY ____	FY ____ REQUEST	FY ____	BALANCE TO COMPLETE	CURRENT PROJECT DEVELOPMENT COST ESTIMATE
PROJECT DEVELOPMENT FUNDING	FACS	Op Plan	Op Plan	Op Plan	Budget Estimate	Budget Estimate	a	PSR Part II

[a] The "Current Project Development Cost Estimate" minus the total of "Prior Years" and all "FY" columns.

Part IV - Principal Milestones

"Part IV - Principal Milestones" tracks the project's progress towards completion of its principal milestones. The principal milestones are displayed vertically down the left-hand column, and progress is tracked horizontally. (See figure III.8.)

Figure III.8: Principal Milestones

PART IV — PRINCIPAL MILESTONES
(Calendar Year and Month)

MILESTONES	INITIAL PROJECT ESTIMATE	DEVELOPMENT ESTIMATE	LAST PSR	THIS PSR/ ACTUAL*	REASON FOR CHANGE
ANNOUNCEMENT OF OPPORTUNITY					
DEVELOPMENT CONTRACTS AWARDED					
ALL PRELIMINARY DESIGN REVIEWS COMPLETED					
ALL CRITICAL DESIGN REVIEWS COMPLETED					
LAUNCH DATE					
PROJECT COMPLETION					

Milestones

The milestones considered to be principal will vary slightly, depending on the nature of the project. The milestones in Part IV are defined as follows:

- The date of the "Announcement of Opportunity" (if applicable) is the day that the scientific community is invited to participate in a NASA program or project.
- The date of "Development Contracts Awarded" is the date when all prime contracts have been awarded.
- The date of "All Preliminary Design Reviews Completed" is the date that the last project element is reviewed for technical compatibility with the project requirements.[2]

[2]NASA will usually conduct separate reviews for each project element at each level of management. For example, a deep space science mission will have preliminary and critical design reviews for the spacecraft and for each on-board experiment at the contractor, field center, and NASA Headquarters levels.

- The date recorded as "All Critical Design Reviews Completed" is the date when the last project element is reviewed to ascertain whether the design complies with NASA requirements. The critical design review typically occurs when the detailed design is 90-percent complete.
- The "Launch Date" is the date the space shuttle or expendable launch vehicle is scheduled to launch the project. For a project requiring more than one launch, such as TDRSS, "Final Satellite Launch" may be an appropriate milestone.
- The "Project Completion" date is the date that NASA managers can make a reasonable assessment of the project's final performance in relation to its stated goals and objectives. The "Project Completion" will vary, depending on the nature of these goals and objectives.

  For example, the "Project Completion" date for a project with a science goal would be the date that NASA managers are able to make preliminary analyses of how well the data obtained contributes to the project's goals. In the case of Magellan, a NASA scientist told us that they will be able to assess how well the project has fulfilled its stated science goal ("to address fundamental questions regarding the origin and evolution of Venus") when it has completed its objectives (one of which is "to map the planet over a 243 day period—one Venus year"). NASA sometimes refers to the completion of objectives as the "nominal mission complete" date. Therefore, although making a definitive statement on how well Magellan achieved its science goals will require many more years of data analysis, a reasonable "Project Completion" date would be the date that the project has completed its nominal mission.[3]

  A different determination for "Project Completion" is made for a project the goal of which is to be put into routine use or to become operational. For example, NASA could identify the project completion date for a space transportation system such as the Advanced Solid Rocket Motor as the "First Operational Flight" or the date when testing is complete and the motor is put into routine use. For a system such as TDRSS, operational status would be achieved when testing of the full constellation of TDRSS satellites is completed. Therefore, "First Operational Use" of the full system could be an appropriate milestone to mark project completion.

[3]NASA officials told us that a "Final Science Report" is routinely prepared for all science projects after the nominal mission has been completed. This report makes an assessment of the project's achieved goals.

Column Headings

The column headings for Part IV, as shown in figure III.9—"Initial Project Estimate," "Development Estimate," "Last PSR," "This PSR/Actual*," and "Reason for Change"—are similar to those in Part II. (See our discussion of these baselines in our section "Estimate/Change Columns," pp. 33-34.)

Figure III.9: Headings for Tracking Principal Milestones

INITIAL PROJECT ESTIMATE	DEVELOPMENT ESTIMATE	LAST PSR	THIS PSR/ ACTUAL*	REASON FOR CHANGE

There is one slight variation from the column headings in Part II: Part IV's "This PSR Estimate/Actual*" column includes a provision for indicating a completed event using an asterisk (*) to signify that the event has occurred.

Part V - Project Goals and Objectives

"Part V - Project Goals and Objectives" tracks the project's progress in meeting its goals and scientific/technical objectives. The points used to track progress in this part are similar to those used in Parts II and IV—that is, "Initial Project Presentation to Congress," "Development Estimate," "Last PSR," "This PSR," "Reason for Change," and "Final Performance Statement." (See our discussion of these baselines in our section "Estimate/Change Columns," pp. 33-34.) Part V, however, differs in the form of presentation. While Parts II and IV list the tracking points horizontally, Part V lists the tracking points vertically down the left-hand column, so there is room to present the narrative information under the two column headings—"Project Goals" and "Science/Technical Objectives." (See figure III.10.) The information should be presented in concise bullet-style phrases and quantified whenever possible. If the information does not fit within the space provided, Part V can be expanded to two pages.

Figure III.10 Project Goals and Objectives

PART V — PROJECT GOALS AND OBJECTIVES

	PROJECT GOALS	SCIENCE/TECHNICAL OBJECTIVES
INITIAL PROJECT PRESENTATION TO CONGRESS		
DEVELOPMENT ESTIMATE		
LAST PSR		
THIS PSR		
REASON FOR CHANGE		
FINAL PERFORMANCE STATEMENT		

"Project Goals" should be stated as the reasons for doing the project. For example, Magellan's project goal is to "to address fundamental questions regarding the origin and evolution of Venus." An example of an operational project goal is provided by the Advanced Solid Rocket Motor project, the goal of which is to increase the space shuttle payload capacity by 12,000 pounds.

The "Science/Technical Objectives" section should specifically and quantifiably describe how the project will achieve its goals. For example, the "Science Objectives" for Magellan, as stated in Magellan's Project Plan and Project Approval Document, are to

- map 70 to 90 percent of Venus, with no systematic gaps except for one pole, with a surface resolution of at least 500 meters and an image resolution of 1 kilometer or better;
- produce maps that reveal the topographic and radar-scattering characteristics of Venus; and
- refine the low-degree and low-order gravity field of Venus and produce high-resolution gravity maps whenever possible.

The "Technical Objectives" section should identify the engineering information, hardware, and instrumentation needed to achieve the project's goals. For example, the technical objectives for the Advanced Solid Rocket Motor could include

- the development of materials and casting processes that can produce a 150-inch diameter motor and
- the use of new non-asbestos insulation materials in conjunction with weldable T-250 steel and High Thrust Prolonged Burn propellant.

As with Parts II and IV, the "Initial Project Presentation to Congress" records the "Project Goals" and "Science/Technical Objectives" statements made by NASA during the new-start approval process and documented in the "Project Initiation Agreement." The "Development Estimate" records the more detailed and further defined statements of goals and objectives that NASA develops for the "Project Plan."

For the sake of brevity, Part V can describe the "Last PSR" and "This PSR" as the "Same as the Development Estimate" or the "Same as the Initial Project Presentation to Congress," when applicable. If a change is made, the "Last PSR" block should list the previous goals and objectives, and the "This PSR" block should list the new ones. Relevant source documents supporting the continuation of or changes in project goals and

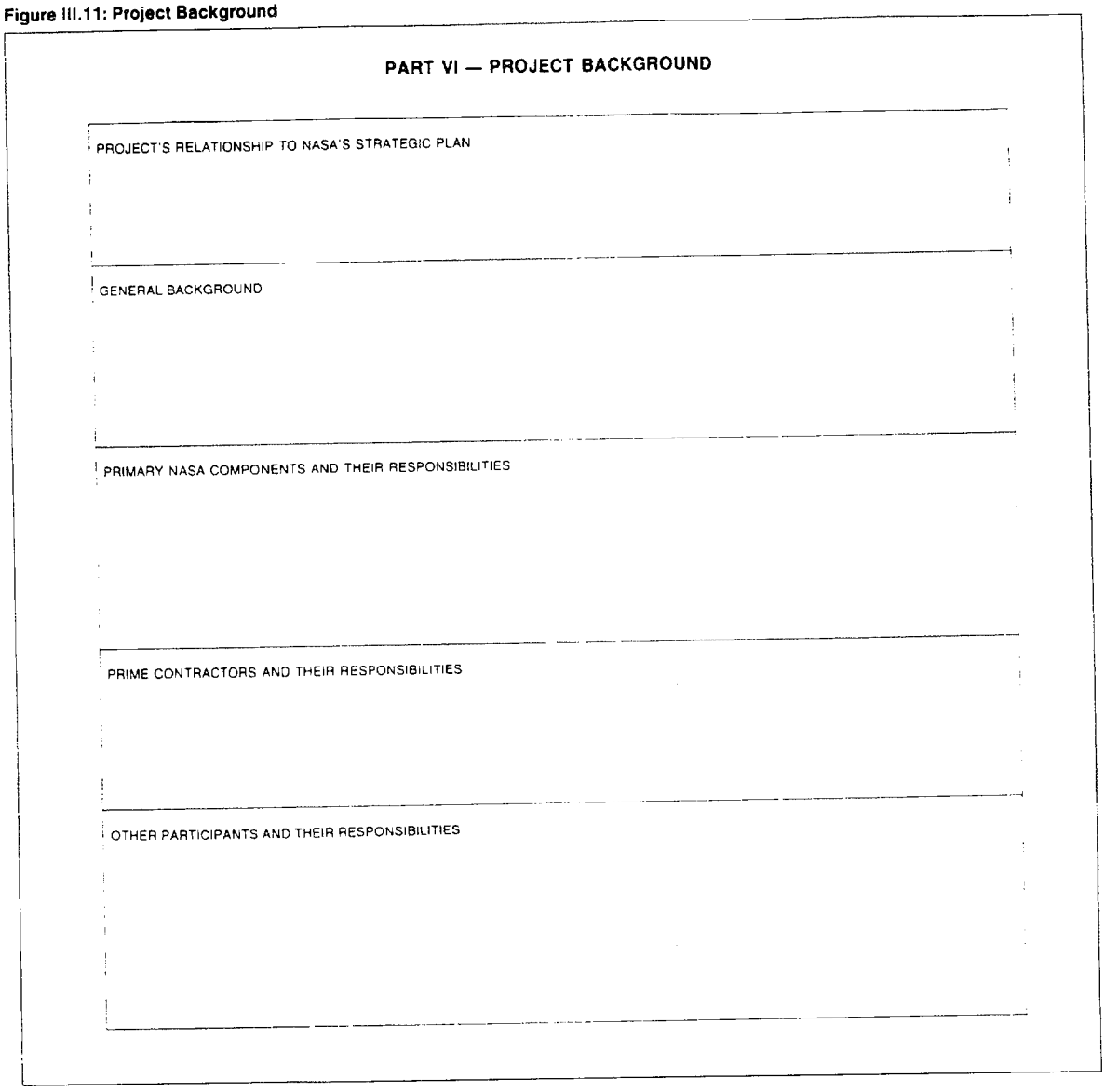
objectives include a project's monthly Project Management Reports and status reviews. The "Reason for Change" column is used to explain any differences between "This PSR" and the "Last PSR."

The "Final Performance Statement" should assess how well the project fulfilled its stated goals and objectives. For example, Magellan project managers should make a final statement as to what percentage of Venus was mapped, what types of maps were produced and at what resolution, and whether the maps revealed the desired information about Venus. This information can be documented by NASA's "Final Science Report." See our section on "Milestones" for an explanation of this report.

Part VI - Project Background

"Part VI - Project Background" provides information on the "Project's Relationship to NASA's Strategic Plan," the "General Background" of the project, the project's "Primary NASA Components and Their Responsibilities," "Prime Contractors and Their Responsibilities," and "Other Participants and Their Responsibilities." (See figure III.11.)

Figure III.11: Project Background



PART VI — PROJECT BACKGROUND

PROJECT'S RELATIONSHIP TO NASA'S STRATEGIC PLAN

GENERAL BACKGROUND

PRIMARY NASA COMPONENTS AND THEIR RESPONSIBILITIES

PRIME CONTRACTORS AND THEIR RESPONSIBILITIES

OTHER PARTICIPANTS AND THEIR RESPONSIBILITIES

The "Project's Relationship to NASA's Strategic Plan" should provide a brief analysis of the relationship between the project's goals as stated in NASA's Strategic Plan (when available) and the project's goals as stated in the primary program office's strategic plan. This section should also describe any project's contribution and/or its relationship to other NASA missions. For example, many scientists consider the origin and evolution of Venus to be similar to the origin and evolution of Earth. Therefore, learning more about the origin and evolution of Venus could contribute to NASA's mission to better understand the planet Earth.

"General Background" should, at a minimum, contain

- the Project Approval Date (the month and year that the project first received congressional new-start approval) and
- the amount of time and money spent on the project before it received new-start approval (during Advanced Studies).

Examples of other information that could be included in "General Background" include

- a description of any plans to extend a science mission, what science goals would be obtained, and what the mission extension would cost and
- an estimate of the annual operating cost for operational projects once they have reached fully operational status.

"Primary NASA Components and Their Responsibilities" should list NASA components (headquarters program offices and field centers) that are extensively involved in the project and their responsibilities.

"Prime Contractors and Their Responsibilities" should list all prime contractors and the goods or services they are obligated to provide.

"Other Participants and Their Responsibilities" should list the roles, responsibilities, and contributions of other involved participants, such as foreign and/or domestic commercial or academic organizations or individuals.

Appendix IV

Major Contributors to This Report

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